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Original Research Article

BACTERIAL PROFILE AND ANTIBIOGRAM FROM DIFFERENT SPECIMENS OF INTENSIVE CARE UNIT

Dr Rakesh Modi[1], Dr Geetesh Mangal[2*]

1. Senior Consultant, Department of Critical Care, NIMS Medical College and Hospital, Jaipur,2.Consultant Intensivist, SDMH, Jaipur.

*Corresponding author – **Dr Geetesh Mangal**
Email id – mangal.geetesh@yahoo.co.in

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ABSTRACT

Background: According to the reports of Global Burden of Diseases study among the low and lower- middle-income countries the major cause of mortality was infections. They reported several risk factors responsible for this high mortality rate which are poverty, increasing old age, illiteracy, rapid urbanization and emerging bacterial infections and viral infections. **Material & Methods**: In the present prospective study, patients who were admitted in ICU during the one year of study period were enrolled by simple random sampling. Clearance from hospital ethics committee was taken before start of study. Written informed consent was taken from each study participant. **Results:** In the present study a total of 640 specimens were sent for isolation of causative pathogens out of them 300 (46.8%) were culture positive with 80% from sputum, 66% from urine, 21% from CSF and 22% from blood. Out of the total Gram-negative bacteria were found predominantly and included Escherichia coli (21%), Acinetobacter baumanii (14%), Klebsiella pneumoniae (13%), Pseudomonas aeruginosa (10%) and Enterobacter aerogenes (6%). Among the gram-positive bacteria Coagulase negative staphylococci (12%) found most commonly which is followed by MRSA (6%), Streptococcus pneumoniae (3%) and Enterococcus faecalis (3%). Candida sp were found in 12% cases. **Conclusion**: We concluded from the present study that on the basis of antibiotic sensitivity among the gram-negative isolates maximum drug sensitivity is shown by the drugs colistin, polymyxin-b and tigecycline and on the basis of antibiotic sensitivity among the gram-positive isolates maximum drug sensitivity is shown by the drugs vancomycin, clindamycin and linezolid.

Key words: APACHE-2, Gram-negative infections, Intensive care units.

INTRODUCTION

According to the reports of Global Burden of Diseases study among the low and lower- middle-income countries the major cause of mortality was infections **(1)**. They reported several risk factors responsible for this high mortality rate which are poverty, increasing old age, illiteracy, rapid urbanization and emerging bacterial infections and viral infections **(2)**. The major cause of mortality and morbidity in India is still infections. Intensive care units (ICU) are reported to be a major cause of acquired infections at health care facilities **(3)**.

In some previous studies it was reported that infections at the time of admission in ICU (primary infections) and nosocomial infections (secondary infections) both are prevalent in ICU settings **(4)**. In various studies the prevalence of ICU infections was varies from 42% to 57%. They reported several risk factors responsible for ICU infections are intrinsic risk factors, patient's age, higher APACHE-2 score, invasive medical devices, associated co morbid conditions, animate objects, overcrowding and multi-drug resistance **(5)**. Various studies reported that antibiotics resistance becoming a serious problem in outcomes of patients in ICU such as emergence of methicillin-resistant Staphylococcus aureus (MRSA), metallo β-lactamase (MBL), Vancomycin-resistant

enterococci (VRE) and carbapenemase-producing gram negative bacterial isolates **(6)**. We conduct the present study to assess the prevalence of infections in ICU settings and to know the bacterial isolates and antibiotic profile.

MATERIALS & METHODS

The present prospective study was conducted at our tertiary care hospital and the study duration was one year from January 2017 to December 2017. A sample size of 200 was calculated at 95% confidence interval at 10% of maximum allowable error. Patients who were admitted in ICU during the one year of study period were enrolled by simple random sampling. Clearance from hospital ethics committee was taken before start of study. Written informed consent was taken from each study participant.

All the data were recorded related to detailed clinical history cause of admission, APACHE -2 scores, and co-morbidities. All study participants admitted in the ICU were subjected for blood and urine culture and sensitivity testing along with other routine laboratoey investigations. Antibiotic susceptibility testing was done by using standard clinical laboratory protocols by standard institute guidelines. Calculation of APACHE-2 score was done by using all the physiological and laboratory variables. Data analysis was carried out using SPSS v22. All tests were done at alpha (level significance) of 5%; means a significant association present if p value was less than 0.05.

RESULTS

In the present study, we enrolled 200 patients admitted in ICU. Out of the total study participants (112) 56% were females and (88) 44% were males. The mean age of study population was 55.76 ± 8.9 years. Direct admissions in the ICU were 98 (49%), 56 (28%) were transferred from other hospitals and 46 (23%) were from wards of our hospital. The most common cause of hospital admissions was neural cause among 31% patients which is followed by cardio-vascular (22%) and respiratory cause (21%). Out of the total 46% were smokers and 40% were alcoholics. Diabetes mellitus was the most common associated comorbidity. Mean APACHE-2 score among the study participants at the time of admission was 23.62 ± 5.47 (median - 21). Out of the total, 51% of study participants were having the Mean APACHE-2 score in the range of 20-29 and out of the total, 58% of study participants were on antibiotics prior to ICU admission.

In the present study a total of 640 specimens were sent for isolation of causative pathogens out of them 300 (46.8%) were culture positive with 80% from sputum, 66% from urine, 21% from CSF and 22% from blood. Out of the total Gram-negative bacteria were found predominantly and included Escherichia coli (21%), Acinetobacter baumanii (14%), Klebsiella pneumoniae (13%), Pseudomonas aeruginosa (10%) and Enterobacter aerogenes (6%). Among the gram-positive bacteria Coagulase negative staphylococci (12%) found most commonly which is followed by MRSA (6%), Streptococcus pneumoniae (3%) and Enterococcus faecalis (3%). Candida sp were found in 12% cases.

Table 1: Distribution of isolates from different specimens of ICU

Isolates	No of specimens
MRSA	18
CONS	36
Pneumococci	9
Enterococci	9
Acinetobacter baumanii	42
Escherichia coli	63
Klebsiella pneumoniae	39
Enterobacter aerogenes	18
Pseudomonas aeruginosa	30
Candida sp	36
Total	**300**

In the present study, on the basis of antibiotic sensitivity we found that among the gram-negative isolates maximum drug sensitivity is shown by the drugs colistin, polymyxin-b and tigecycline.

In the present study, on the basis of antibiotic sensitivity we found that among the gram-positive isolates maximum drug sensitivity is shown by the drugs vancomycin, clindamycin and linezolid.

Table 2: Antibiogram of gram-negative isolates.

Antibiotic	Acinetobacter baumanii sensitivity	E.coli sensitivity	Klebsiella pneumoniae sensitivity	Pseudomonas aeruginosa sensitivity	Enterobacter aerogenes sensitivity
Imipenem	95.6	90.1	84.6	82.3	90.7
Meropenem	91.2	89.4	83.5	81.3	90.1
Cefoperazone+sulbactam	83.4	83.9	80.7	76.8	83.2
Piperacillin+tazobactam	89	83.1	90.4	92.6	93
Colistin	99	100	100	98.7	100
Polymyxin-b	99	100	100	94.5	100
Tigecycline	98	100	100	100	100

Table 3: Antibiogram of gram-positive isolates

Antibiotic	CONS sensitivity	MRSA sensitivity	Enterococci sensitivity	Pneumococci sensitivity
Penicillin	31.6	0	89.4	82.6
Vancomycin	100	98.1	100	100
Linezolid	100	100	100	100
Clindamycin	93.2	88.1	83.5	100

DISCUSSION

In the present study, we enrolled 200 patients admitted in ICU. Out of the total study participants (112) 56% were females and (88) 44% were males. The mean age of study population was 55.76 ± 8.9 years. Direct admissions in the ICU were 98 (49%), 56 (28%) were transferred from other hospitals and 46 (23%) were from wards of our hospital. The most common cause of hospital admissions was neural cause among 31% patients which is followed by cardio-vascular (22%) and respiratory cause (21%). Out of the total 46% were smokers and 40% were alcoholics. Diabetes mellitus was the most common associated comorbidity. Mean APACHE-2 score among the study participants at the time of admission was 23.62 ± 5.47 (median - 21). Out of the total, 51% of study participants were having the Mean APACHE-2 score in the range of 20-29 and out of the total, 58% of study participants were on antibiotics prior to ICU admission. Similar results were obtained in a study conducted by Rosenthal V et al and found similar study to the present study. They conducted study among 422 intensive care units (ICUs) of 36 countries and found nearly similar results to the present study **(7)**. Similar results were obtained in a study conducted by Phua J et al and found similar study to the present study. They conducted study among 1285 patients of 150 intensive care units (ICUs) of 16 countries and found that nearly similar results to the present study **(8)**.

In the present study a total of 640 specimens were sent for isolation of causative pathogens out of them 300 (46.8%) were culture positive with 80% from sputum, 66% from urine, 21% from CSF and 22% from blood. Out of the total Gram-negative bacteria were found predominantly and included Escherichia coli (21%), Acinetobacter baumanii (14%), Klebsiella pneumoniae (13%), Pseudomonas aeruginosa (10%) and Enterobacter aerogenes (6%). Among the gram-positive bacteria Coagulase negative staphylococci (12%) found most commonly which is followed by MRSA (6%), Streptococcus pneumoniae (3%) and Enterococcus faecalis (3%). Candida sp were found in 12% cases. Similar results were obtained in a study conducted by Kapadia Fet al and found similar results to the present study. They conducted study among intensive care units of 4 major tertiary care hospitals and found that ICU infections contributing in mortality and morbidity (9). Similar results were obtained in a study conducted by Patwardhan R et al and found similar results to the present study. They found that most common infections found in ICU were

due to gram negative pathogens like Escherichia coli, Acinetobacter baumannii, Klebsiella pneumoniae and Pseudomonas aeruginosa which was followed by Staphylococcus aureus and Streptococcus pyogenes **(10)**.

In the present study, on the basis of antibiotic sensitivity we found that among the gram-negative isolates maximum drug sensitivity is shown by the drugs colistin, polymyxin-b and tigecycline. In the present study, on the basis of antibiotic sensitivity we found that among the gram-positive isolates maximum drug sensitivity is shown by the drugs vancomycin, clindamycin and linezolid. Similar results were obtained in a study conducted by Kumarasamy K et al and found similar results to the present study. They studied gram-negative Enterobacteriaceae resistance to carbapenem conferred by metallo-beta-lactamase 1 (NDM-1) and investigated the magnitude of NDM-1 among multidrug-resistant Enterobacteriaceae **(11)**. Similar results were obtained in a study conducted by Sarvepalli et al and found similar results to the present study. They conducted study among 330 patients over a period of one year and found that on the basis of antibiotic sensitivity among the gram-negative isolates maximum drug sensitivity is shown by the drugs colistin, polymyxin-b and tigecycline and on the basis of antibiotic sensitivity among the gram-positive isolates maximum drug sensitivity is shown by the drugs vancomycin, clindamycin and linezolid **(12)**.

CONCLUSION

We concluded from the present study that on the basis of antibiotic sensitivity among the gram-negative isolates maximum drug sensitivity is shown by the drugs colistin, polymyxin-b and tigecycline and on the basis of antibiotic sensitivity among the gram-positive isolates maximum drug sensitivity is shown by the drugs vancomycin, clindamycin and linezolid.

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